becomes more marked, and the author is sometimes at pains to show that the doctrine he is discussing has reference purely to formal logic. The subjects dealt with are of the first importance. For example, the relation of logic to mathematics is discussed with very penetrating criticism, and Mr. Johnson finds that he differs from Mr. Russell on the fundamental concept of this relation. The mathematical function is for Mr. Russell a description derivable from the propositional function of logic, whereas Mr. Johnson argues that the propositional function of logic is nothing but a particular case of the mathematical. In discussing functional deduction generally Mr. Johnson says "the essential purpose of symbolism is to economise the exercise of thought; and thus symbolic methods are worse than useless in studying the philosophy of symbolism or of mathematics in particular."

There are many new distinctions discovered and new terms proposed. In particular we are to distinguish two direct principles of inference, the applicative and the implicative, each with a counter principle; we are to add to the distinctions of magnitudes as extensive and intensive an intermediate form termed distensive; and, more important still, we are to distinguish between the question of the absoluteness or relativity of space and time and the question of their substantival or adjectival nature. But perhaps the most astonishing distinction of all (is it a new discovery?) is that of the syllogism and the antilogism. The antilogism like the syllogism has its four modes AEIO, and, in the illustration given, simply by altering the mode we can present the argument for new realism, the argument for Hume's scepticism, or the argument for Kant's formalism. Verily formal logic may be in the way of becoming a formidable weapon in the hands of a philosophical controversialist.

Terrestrial Magnetism in the Antarctic.

British ("Terra Nova") Antarctic Expedition, 1910–1913: *Terrestrial Magnetism.* By Dr. C. Chree. Pp. xii + 548 + 60 plates. (London: Harrison and Sons, Ltd., 1921.)

BOTH of Captain Scott's Antarctic expeditions included observations of the earth's magnetism in their programme of scientific work, and the experience gained in the first was turned to good use in the second. The two magnetic observers were Dr. G. C. Simpson and Mr. C. S. Wright, to whom is due the credit for the fine work done at the base station. A noteworthy improvement was made by Dr. Simpson in the method of time-marking on the magnetograph sheets, which has since been adopted in some regular magnetic observatories. The magnetographs were in operation for nearly two years (February 1911 to November 1912); at the beginning of the second year Dr. Simpson was recalled to his official duties in India. Besides the continuous record of the three magnetic elements at Cape Evans, a considerable number of absolute measurements were made by the naval officers of the expedition, both in the "field" (principally at Cape Adare) and at sea.

The important task of preparing a report describing and discussing all these observations was entrusted, as in the case of the former expedition, to Dr. Chree. This report has just been issued, in the form of a large quarto volume, prepared and published at the cost of the fund raised by public subscription in memory of Captain Scott and his companions. Apart from the observations taken by the naval officers, which were mainly reduced by themselves, not only the discussion but also the reduction of the observations has been executed by or under the supervision of Dr. Chree; the measurement of the magnetograph curves, the reduction of the measurements, and the discussion of the important but somewhat tedious instrumental questions which arise, involve an amount of labour which can be but little appreciated by those unfamiliar with the subject. Of the 548 pages of letterpress, about one hundred are devoted to the tables, giving hourly values of the three magnetic elements, while about one-quarter of the volume is occupied by a valuable set of plates, mainly reproducing actual magnetograph records, from the Antarctic or elsewhere.

Following out his characteristic plan, Dr. Chree has kept strictly to the comparison and discussion of facts as facts; the echoes of theoretical controversy can be at most remotely perceived, and speculations as to the cause of the phenomena reviewed with such painstaking care are expressly deprecated by the author. Whether or not it is best at all times to restrict the discussion within these severe limits of certainty, few can disagree with the adoption of the course in preparing a report of this kind. In the spirit with which he has approached the task Dr. Chree has shown, not only his devotion to his chosen science, but also his personal appreciation of the work done by those who obtained the observations, or made the observations possible, in the inhospitable regions of the Antarctic.

The general plan of the volume is similar to that of the one dealing with the earlier expedition. The first six chapters describe the reductions which lead to the monthly mean values, non-cyclic changes, diurnal inequalities (with Fourier coefficients), daily range, and daily maxima and minima of the magnetic

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elements; the rest of the discussion is on more individual and less standard lines. Dr. Chree devotes great attention to the important subject of the magnetic "activity"—its variations from day to day and from hour to hour, and its connection with other magnetic characteristics. He finds, for instance, that the remarkable differences existing between the Antarctic diurnal magnetic variations on quiet and on disturbed days are by no means merely proportionately intensified forms of the corresponding differences in temperate latitudes. Again, he investigates the tendency for a given state of magnetic activity to recur after twenty-seven days, a phenomenon long ago suggested by Broun and others, and independently established and brought into prominence more recently by Mr. Maunder. Dr. Chree uses his own admirable method based on daily character figures, and finds the tendency to be as clearly shown by the Antarctic as by the Kew records. The variation of the magnetic activity throughout the day, and even over short periods of an hour or so, has also been studied, the latter with the aid of the quick-speed records arranged to be taken simultaneously for "term hours" at the Antarctic and at many co-operating observatories. While these records have proved useful for the purpose named, Dr. Chree expresses doubt as to the desirability of including this arrangement in the programme of future polar expeditions.

Another subject discussed in much detail is magnetic disturbance of various kinds, including "sudden commencements," whether followed by a magnetic storm or not, large disturbances (studied from Antarctic and other records) and short-period disturbances. Some cases of the repetitions of disturbances at about the same hour on successive or adjacent days, such as were first noticed by Señor Capello in the Lisbon curves, were found in the Antarctic records, and are illustrated; it is to be regretted that the corresponding curves from other observatories were not obtained for these as well as for the larger disturbances discussed.

With the co-operation of Mr. C. S. Wright, an interesting chapter on the relation between auroræ and magnetic disturbance is included. In this chapter various definite numerical criteria are applied to test the view generally held that there is a close connection between the two phenomena. It is so difficult, on account of daylight, clouds and moonlight, to get records of auroræ at all comparable with the magnetic records in continuity or completeness that it requires some ingenuity to devise satisfactory numerical tests of the connection; Dr. Chree's tables succeed in confirming it, as they show that 41 per cent. of the "first-class" auroræ observed were associated with days of character-figure 2 (connoting a magnetically disturbed day), while no single aurora of the fourth class was so associated. It appears also that auroræ are probably rarely, if ever, totally absent, even at the times most quiet magnetically.

In order to utilise the results to the best advantage, Dr. Chree has not shrunk from entering upon enormous pieces of arithmetical computation, and the preparation of this report has been an enterprise which even those naturally most inclined towards numerical work might have shirked. The volume is necessarily restricted in its appeal, but magneticians will everywhere be grateful to Dr. Chree for the clear and accurate way in which he has ascertained and presented so many of the leading facts regarding the magnetic phenomena of the Antarctic.

The Analysis of Drugs.

The Chemistry and Analysis of Drugs and Medicines. By H. C. Fuller. Pp. ix + 1072. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1920.) 55*s*. net.

THE number of drugs in use at the present day runs into thousands, and each of them is a component of one or more, often many more, "medicines." The materials used as drugs include such diverse products as plants the constituents of which are unknown, elementary substances such as colloidal copper and sulphur, and complex but well-defined compounds like "salvarsan." To prepare a comprehensive account of the analysis of drugs and medicines is therefore a difficult task, and one may doubt Mr. Fuller's wisdom, but not his courage, in tackling it.

He has produced a book which is inclusive rather than useful, and is unnecessarily large, owing to faults in the arrangement of matter and to needless repetition; thus the assay of the principal crude drugs is described in chap. 2, and drugs which contain alkaloids or glucosides are discussed again in the chapters devoted to these constituents, with the result that the determination of morphine in opium is dealt with on pp. 53-60, and a second set of processes for this operation is given on pp. 211-13, a cross-reference being provided in neither case.

Many authors inadvertently repeat themselves, but it must be unusual to find such a case as that of saligenin in this book, which is described twice, each time under a central heading in heavy type on the same page (553), and a third time on p. 787; the headings are different each time, viz. "ortho-oxybenzyl alcohol," "salicyl alcohol," and "saligenin," but a chemist, with his daily experience of vagaries in nomenclature, should be prepared for such pitfalls.

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